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(54) IMPROVEMENTS IN AND RELATING TO STRUCTURAL  
SUPPORTS FOR CONCRETE FORMWORK PANELS

(71) We, ACROW (ENGINEERS) LIMITED, a British Company of South Wharf, London, W.2., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to concrete formwork and especially to the formwork panel supporting struts which are commonly known as "soldiers" and which are used to support timber or metal walings to wall formwork when used, vertically, or timber on metal bearers or formwork panels for floor formwork when used horizontally.

Hitherto such "soldiers" have been either solid or lattice type girders having two beams connected by open lattice work.

A structural beam for use as a soldier in concrete formwork in accordance with this invention comprises upper and lower chords interconnected along at least part of the beam length by a web of undulate form with spaced lengths interconnecting the chords on one side being joined with transversely extending parts to alternating adjacent spaced lengths on the other side, similarly interconnecting the chords, the upper and lower chords being formed with aligned apertures so that ties can extend through the beam.

35 This creates in effect a continuous but staggered web which allows tie rods and the like to pass through it in a number of positions. The soldier can be thinner than a comparable lattice girder as it is more rigid and has many of the strength to weight characteristics of an I-section girder but without the continuously extending web.

The spaced lengths of the web are conveniently equal except perhaps at the ends of the girder and the chords may for example be of top-hat section. The web will

normally be welded to the chords by a continuous weld which preferably extends along both sides of the web plate.

As a modification the chords may each comprise two longitudinally extending elements the apertures being formed by spaces between the elements. The elements are preferably tubular. The undulate web may extend only along the end portions of the beam the central portion having the chords connected by a lattice preferably two lattice members one at each side and each comprising a bar or rod formed into a zig-zag shape the apices being connected to the chords and the apices of one being staggered with respect to the apices of the other. In this case the chords are preferably of top-hat section. The webs act to rigidify the end sections and aid in resistance to shear at those areas through which wall ties are required to pass.

The pitch of the zig-zags may be varied as required for strength considerations for example the pitch may be 1' or 10".

Soldiers in accordance with the invention are lighter in weight whilst being as straight and rigid as conventional soldiers and ties or the like can pass through the soldiers at any desired position.

An example of soldiers in accordance with the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a plan of one embodiment of a soldier;

Figure 2 is a corresponding end elevation;

Figure 3 is a side elevation;

Figure 4 is a side elevation of an alternative embodiment of a soldier in accordance with the invention;

Figure 5 is a plan view of Figure 4;

Figure 6 is a view of an end section of the soldier of Figure 4 to an enlarged scale;

Figure 7 is a section on the line A-A of Figure 6;

Figure 8 is a section on the line B-B of Figure 6; and

Figure 9 is an elevation showing soldiers in accordance with the invention in use to support both vertical and horizontally positioned formwork panels.

Referring to Figures 1-3 of the drawings the soldier comprises four longitudinal elements 2 each of square tubular form and arranged at the four corners of a rectangle as seen in end elevation in Figure 2.

The pair of adjacent elements 2' are connected together along a series of equal spaced lengths 6 by a continuous web 4 which also connects together the other pair of elements 2'' along an alternating series of equal spaced lengths 8. The web extends transversely across between the pairs of elements 2' and 2'' as seen at 10 to connect these pairs together.

The plate web is welded to the tubular corner element 2 along the spaced length as illustrated in Figure 3 by a continuous weld along both sides of the plate.

As an example the distance between the elements of a pair can be four times that between pairs.

The soldier can either be used horizontally or vertically and ties or the like can be inserted in the spaces 12 between the pairs of elements at all positions along the strut except of course at these locations 10 where the web plate crosses between the pairs.

The lengths 14 at each end of the soldier are shorter than the remaining lengths 6 and 8 and the ends are conveniently closed by plates 16 extending across welded to the ends of all four elements.

A bracket or the like for a working platform can be inserted between the tubular corner elements against the web so that it is supported in three directions and so that it need only be pinned to hold it in position.

As an alternative the web can extend across between the pairs of corner elements at an angle (other than a right angle) e.g. at an angle of about 45° to the longitudinal axis of the element.

Referring to Figures 4-8, the soldier comprises top and bottom chord plates 22, 24 of inverted 'top-hat' section, as can clearly be seen in Figure 7, providing dished flanges 26 at each side to receive the apices of two longitudinally extending zig-zag bars or rods 28, 30 which provide a lattice web connecting the chord plates over the majority of the length of the soldier. As can clearly be seen from the drawings the apices of the rod 28 are staggered as compared with the apices of the rod 30 to provide greater strength.

Each end section is provided with a web plate 32 which extends between and connects

the chord plates between the two lattice members 28, 30 alongside one of which it extends for a short length 34 and alongside the other of which it is also extended along staggered spaced lengths 36, the plate extending transversely across between the lattice members at 38 between each longitudinally extending length. The chord plates are provided with aligned slots 40 opposite the lengths 34, 36 to enable tie rods or the like to pass across the depth of the soldier at these points.

Similar or somewhat different holes may be provided through the chords along the whole length of the soldier to enable working platforms or support struts to be attached or ties to be inserted through the soldier. The ends of the soldiers are closed by plates 41.

The soldier is cambered along its length on both faces of its chord members e.g. it may have a depth of 9½" at its centre and only 9¼" at each end so that a camber of ½" at each side is present. The camber is pre-set to minimise the effect of deflection under load and is incorporated in both face as either face may be connected to the formwork.

Referring to Figure 9, a soldier such as that described with reference to Figures 4-8 is shown at 42 positioned horizontally to support horizontal formwork 44 on which a horizontal concrete slab 46 is cast. Similar soldiers are shown at 48 positioned vertically to support walings 50 of the two vertical formwork walls 52 between which concrete is cast to form a vertical wall 54. Ties 56 extend across the space through the top and bottom sections of the soldiers through holes 40 alongside the portions 34 or 36 of the webs 32.

#### WHAT WE CLAIM IS:—

1. A structural beam for supporting concrete formwork comprising upper and lower chords interconnected along at least part of the beam length by a web of undulate form with spaced lengths interconnecting the chords on one side being joined with transversely extending parts to alternating adjacent spaced lengths on the other side, similarly interconnecting the chords, the upper and lower chords being formed with aligned apertures so that ties can extend through the beam.

2. A structural beam as claimed in Claim 1 in which each chord is a composite member comprising two longitudinally extending elements and the apertures are formed by spaces between the elements.

3. A beam as claimed in Claim 1 or Claim 2 wherein the spaced lengths of the web are equal throughout the majority of the length of the beam.

4. A beam as claimed in Claim 2 or 3

wherein the longitudinally extending elements are tubular.

5 A beam as claimed in any of the preceding claims wherein the web is secured to the chords by continuous weld.

10 6. A structural beam as claimed in any preceding claim in which the web of undulate form extends only along the end portions of the beam, the remaining central portion of the beam having the chords connected by at least one lattice.

15 7. A structural beam as claimed in Claim 6 having one lattice at each side each lattice comprising a bar or rod formed into a zig-zag shape with the apices connected to the chords, the apices of one lattice being

staggered relative to the apices of the other lattice.

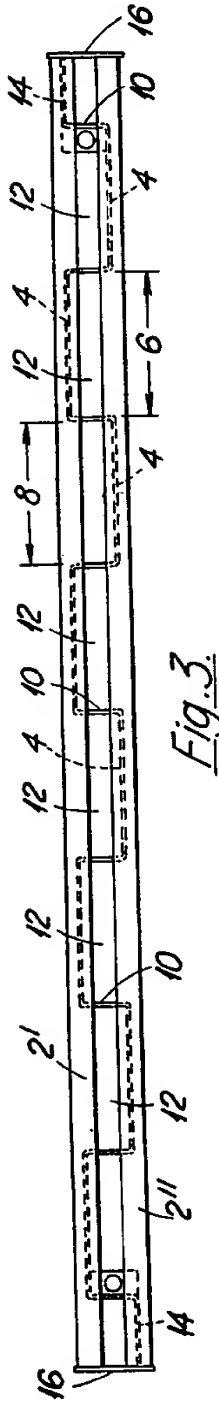
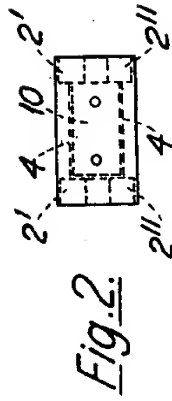
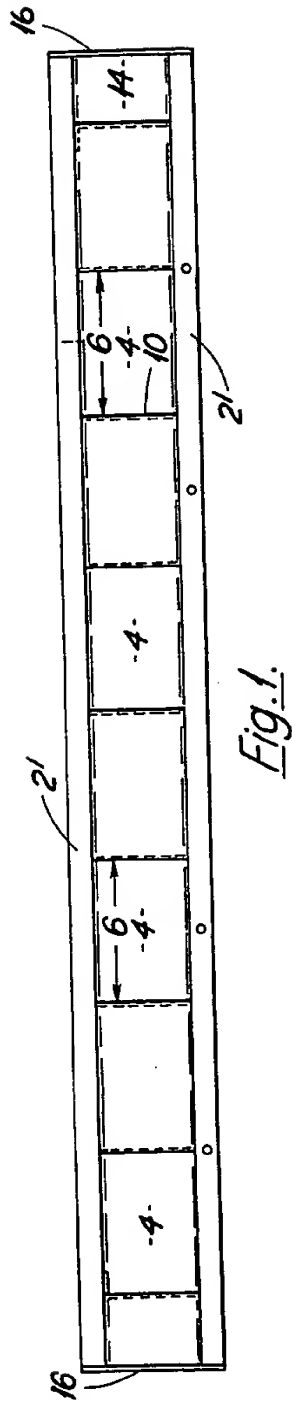
8. A beam as claimed in Claim 7 wherein the chord plates are of inverted "top-hat" section. 20

9. A structural beam substantially as hereinbefore described with reference to either Figures 1-3 or 4-8 of the accompanying drawings. 25

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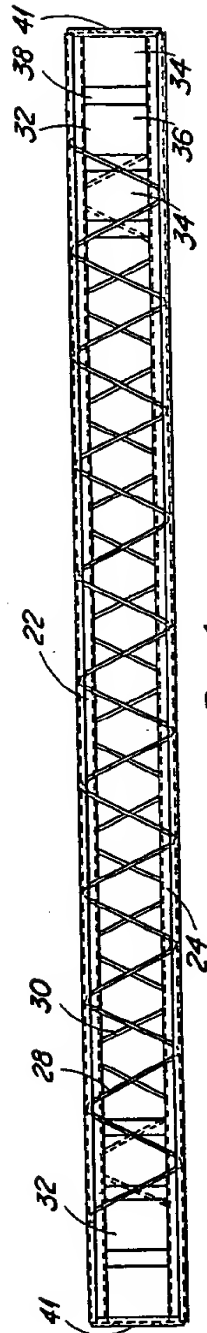


Fig. 4.

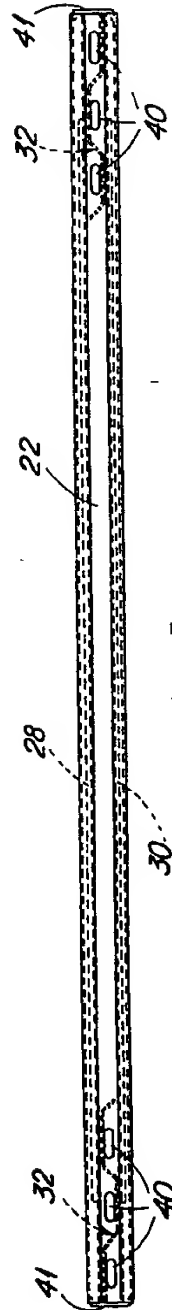


Fig. 5.

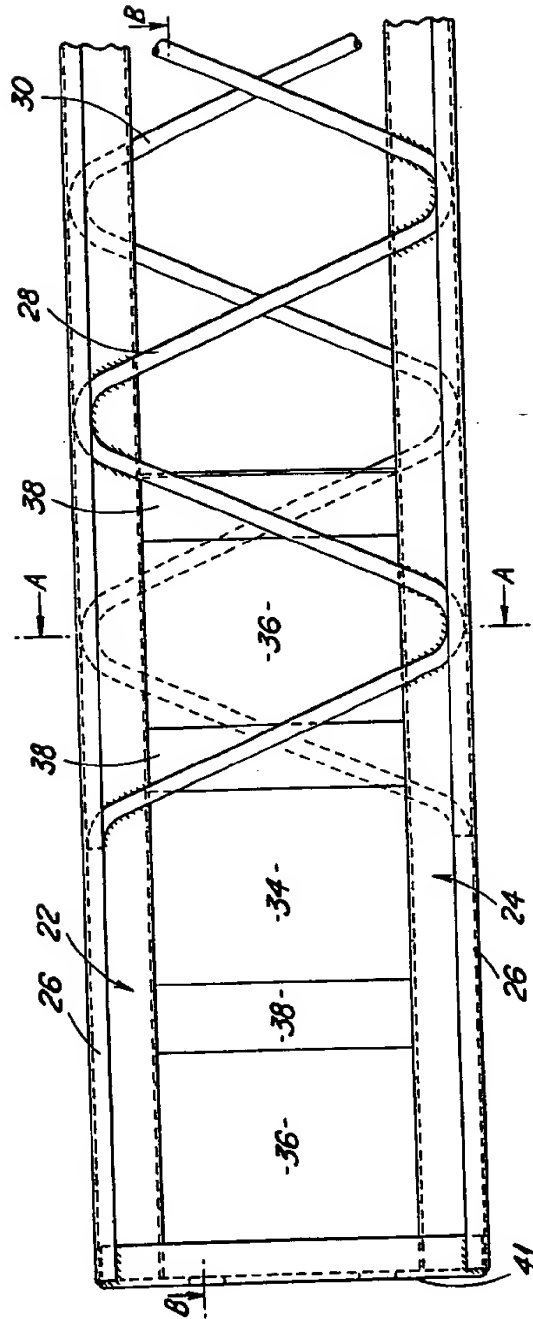


Fig. 6

